Geared and Belt Heads

Professional motion picture camera support

Written by Ryan Patrick O'Hara

At the dawn of cinema, (roughly 1895), the motion picture camera found itself appropriately established upon the still photographer's tripod system. It would not be long until motion picture cameramen discovered and desired the ability to move the camera *during* the shot. The earliest tripod heads, which incorporated the ability to pan (shortly thereafter pan *and* tilt), show an uncanny resemblance to future geared head technology and design.

The text, *A History of Early Film Volume II* by Stephen Herbert, is a series of collected film article reprints from material dating from the mid 1890's to around 1914. These articles serve as a glimpse into the technical side of early film history. Within the collection, a reprint of *The Handbook of Kinematography* by Colin N Bennett (1911), outlines the main difference between the photography tripod and the motion picture tripod within Chapter III:

> *"…And that last remark about the tripod leads on insensibly to consideration of this absolutely indispensable part of the motion picture man's equipment. Tripods for motion picture work differ from those used in still view photography chiefly on two points, one being their weight… and the other the presence of mechanical turning movements in the tripod head."*

The following diagrams and text are edited excerpts from *The Handbook of Kinematography* (1911). One can see the familiar resemblance to what can only be described as the foundation and evolutionary ancestor of the modern day geared head.

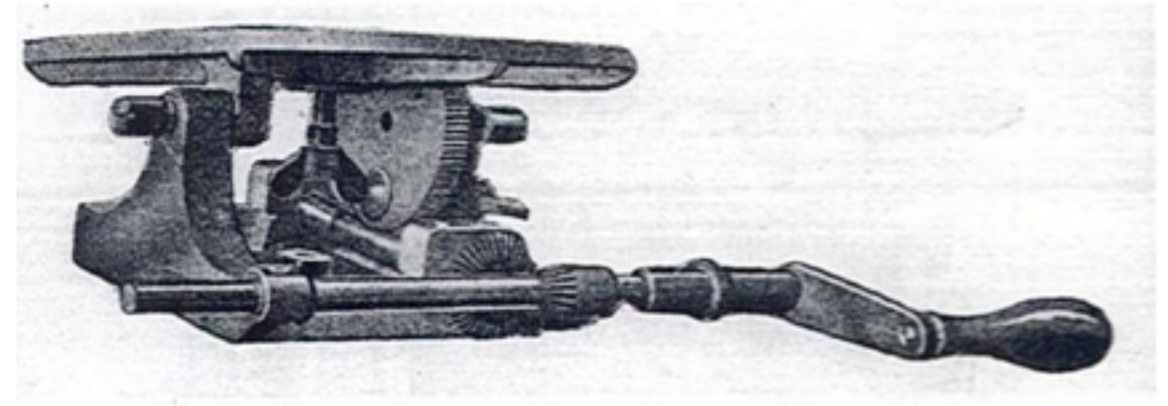


FIG. 14.—WRENCH REVOLVING TRIPOD HEAD WITH TILTING TABLE

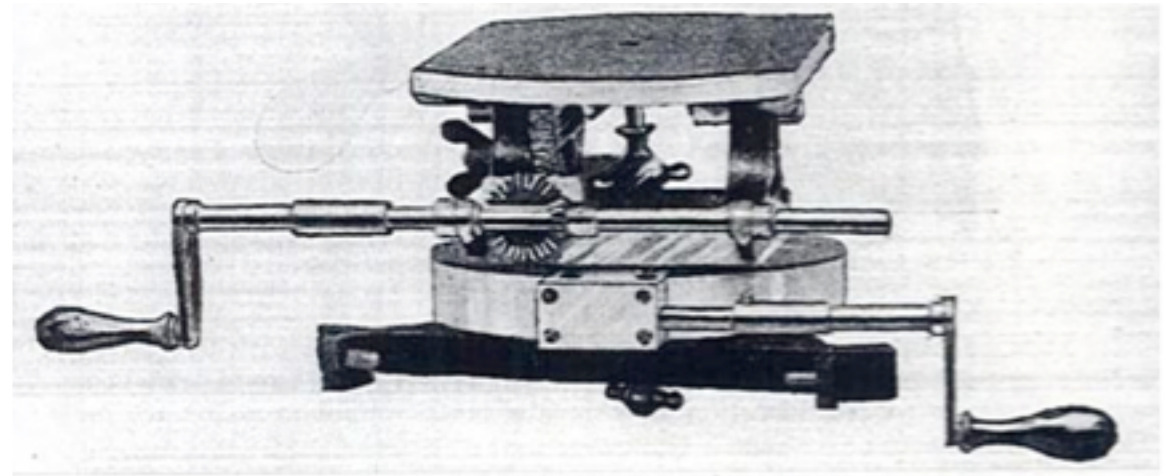


FIG. 15.—A COMPLICATED TRIPOD HEAD.

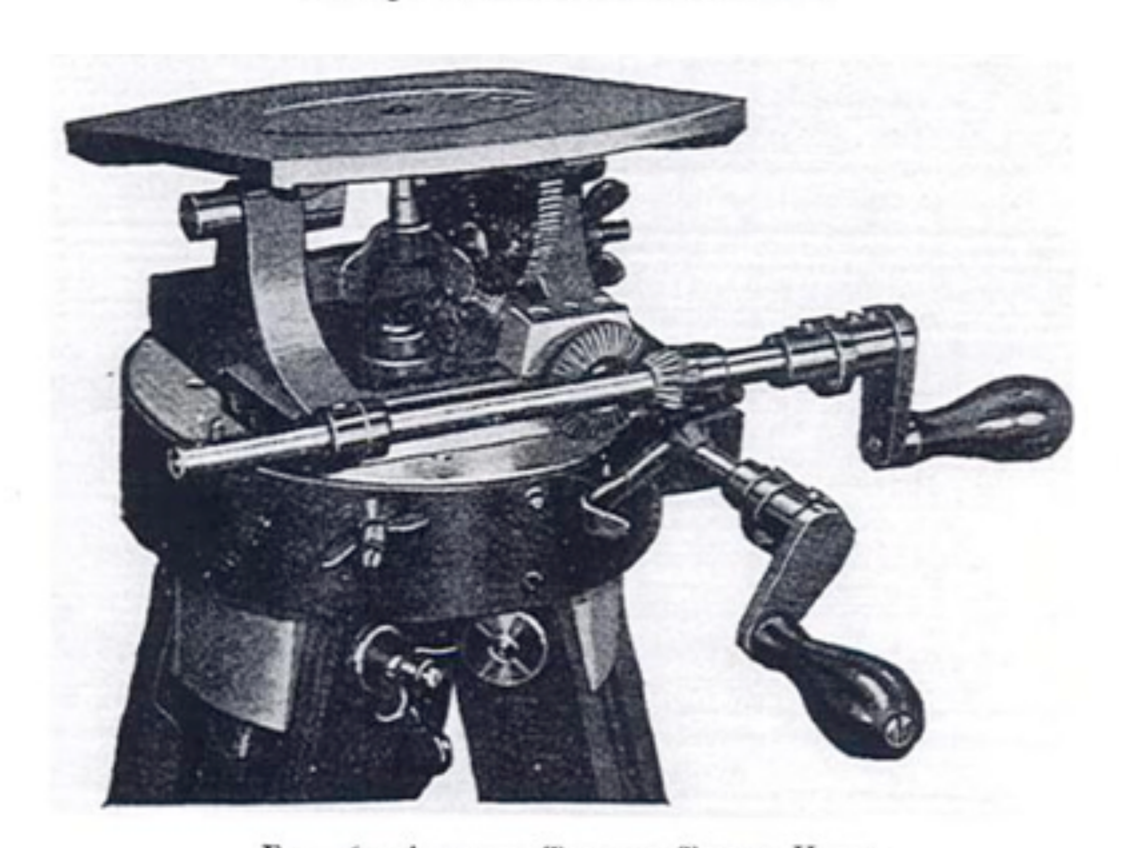


FIG. 16.—ANOTHER TYPE OF TRIPOD HEAD.

Tripods for motion picture work differ from those used in still view photography chiefly on two points, one being their weight—fourteen to sixteen pounds is very moderate for a kinematograph tripod—and the other the presence of mechanical turning movements in the tripod head. Figs. 14 and 15 illustrate two forms of mechanical tripod heads, the first from those excellent makers of apparatus, Wrench and Son, and the other from Pathé Frères. The simpler one, possessing only one handle, is what is known as a 'panoram' head. In this case, the table top surface upon which the camera is bolted, can be made to revolve slowly round and round in either direction, by virtue of turning the actuating handle to or from the operator.

The more complicated tripod head possesses beyond this panoram action, a second camera tilting device, also worked by a handle-turning attachment, and sometimes referred to as a 'maxim' movement, from the similarity between it and the elevating mechanism of the Maxim gun. The Maxim attachment is very convenient at all times

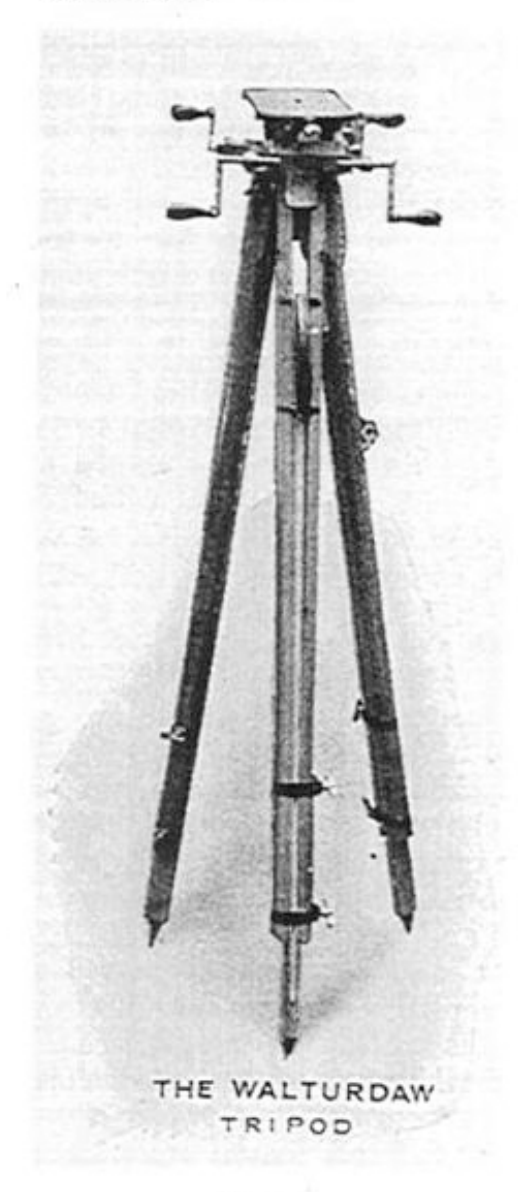


FIG. 17.
TRIPOD WITH HEAD ATTACHED.

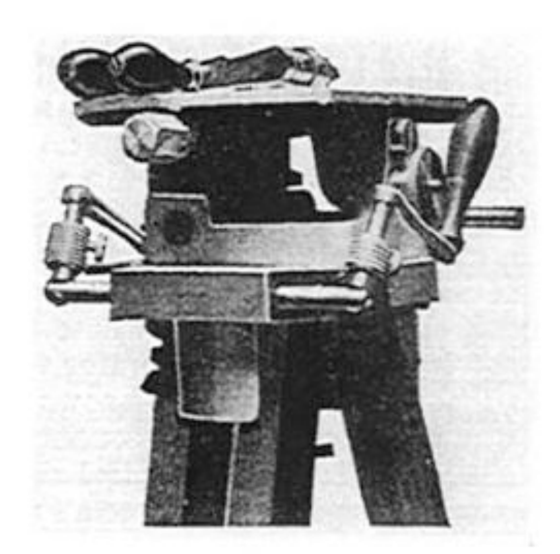


FIG. 18.
CAMERA HEAD, SHOWING HANDLES CLOSED.

and especially where it is desired to obtain a wide panorama of objects above or beneath the camera level. In fact, without it, such slanting panoramic attempts are sure to show a tipping of the horizon at some point or other in the resulting picture. Illustration 16 gives another close view of the combined revolving and tilting head as fitted to one of Messrs. Butcher's motion picture tripods.

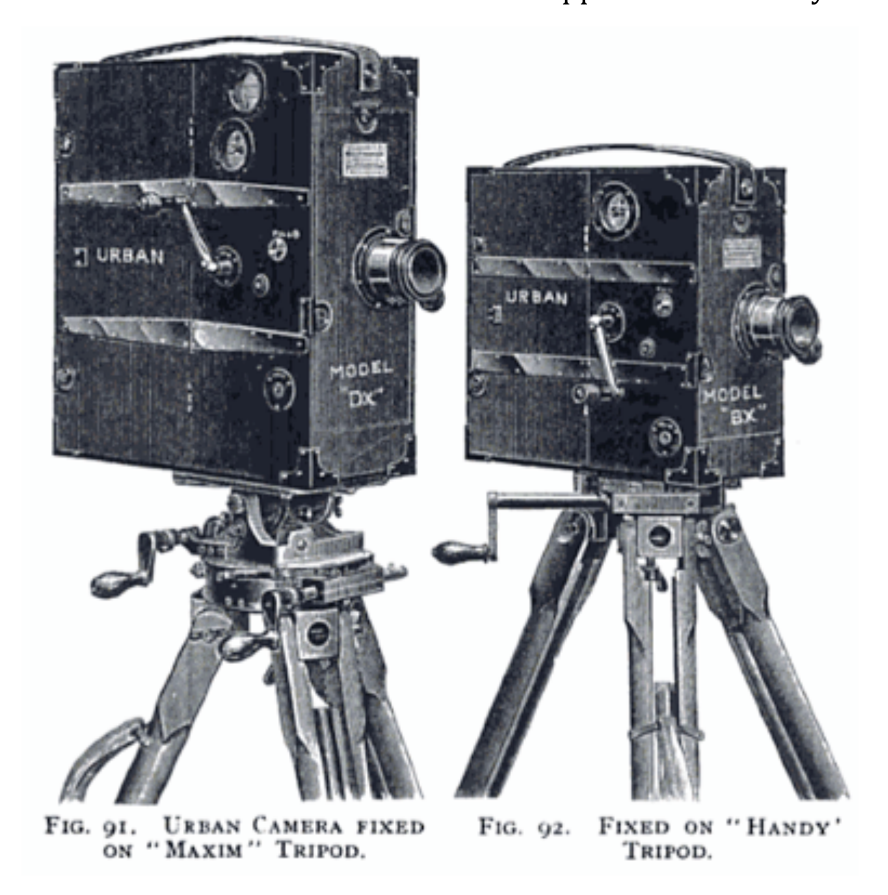


FIG. 91. URBAN CAMERA FIXED ON "MAXIM" TRIPOD. FIG. 92. FIXED ON "HANDY" TRIPOD.

The simpler version of the motion picture tripod, the 'panoram' head, could only turn side to side, while the more complicated motion picture tripod possessed a second 'tilting' mechanism sometimes known as the 'maxim' movement. Both movements were mechanically controlled by the cameraman via handles or cranks connected to a series of gears. Noticing the placement, operation, and likeness of the handles and gears (especially in fig. 16), it should be obvious that even the earliest geared heads would serve inspiration to the future design of larger geared heads and the modern geared heads.

The larger cradle design geared head was developed around the time sound was being introduced into moving pictures. The cameras had grown in considerable size, now being contained within a blimp housing. Although the cradle design matchs what we consider the standard form of a modern day geared heads; these geared heads lacked technological advancements and performance standards which is associated with the modern geared head.

As time progressed, so would other tripod head designs, such as friction heads. In 1949 Chadwell O'Connor, an amateur locomotive filmmaker, invented the world's first counterbalanced fluid drag camera head, which enabled his pictures to be smooth.



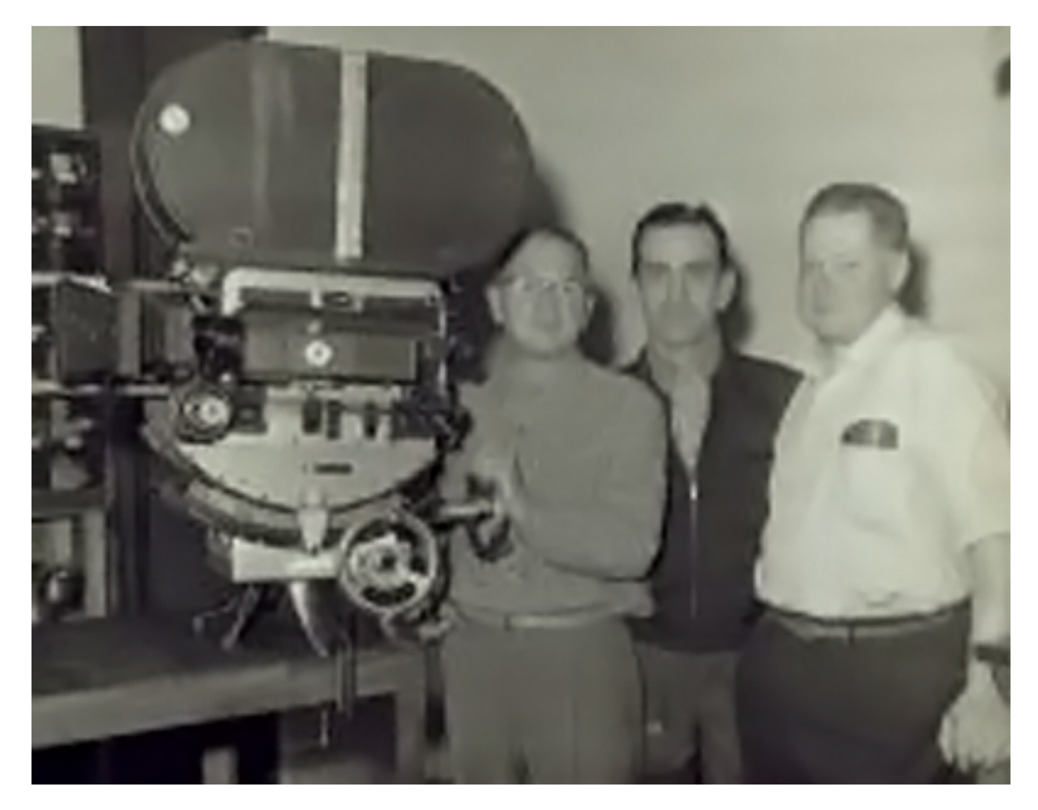

Chadwell O'Connor


George Worrall

Three years later, in 1952, a man by the name of George Worrall invented the Worrall Geared Head. This milestone in professional camera support is considered to be the birth of the *modern* geared head. So much so, that in 1996 the *Society of Operating Cameramen* (SOC) awarded Worrall with the Technical Achievement award for the… *"Invention, introduction, and the development of the Worrall Geared Head in 1952, the first stable, smooth and balanced triple- mode geared head."*

The following is an excerpt from the SOC magazine:

"The truth is, George Worrall refused to call it an invention," related Dean Cundey. "He insisted it was simply a mechanical device based on common sense." Cundey joked about his first job as an operator which ironically fell into his lap when his DP was not able to operate anything but a fluid head. Cundey said wryly, "Thanks George for all the laughs your device provided over the years as we watched producers and directors try to follow the action with those 'oh so confusing' wheels." Accepting the award on his father's behalf was George Worrall Jr. He thanked the SOC and then provided a short video of his dad working at their machine shop and saying to the attendees, "I'm gratified and very thankful to be honored by the users of my geared head. Thank you."



Worrall & The Worrall Geared Head

Upon the almost concurrent birth of the fluid head and what is considered the modern geared head, future professional motion picture camera support would be primarily divided between these two systems.

The following pages are a compiled listing of geared head makes and models which are common and uncommon in the industry. For the sake of brevity, it should be mentioned the phrase 'geared head' has and will continue to refer to both gear and belt driven heads. Many of the following makes or models are not currently produced and lack readily available technical information.

- **Arrihead I**
- **Arrihead II**
- **Arri/Mitchell Geared Head**
- **Ceco Blimp Type 2-Speed Geared Head (TH-7)**
- **Ceco Pro-Jr. Geared Head**
- **GearNex Gearhead**
- **Houston Fearless Cradle Head (Not a Geared Head)**
- **MGM Geared Head**
- **Mitchell Geared Head**
- **Mitchell Mini (Lightweight) Geared Head**
- **Mitchell Vitesse Geared Head**
- **Mitchell Vista-Vision Geared Head**
- **Mole Richardson Geared Heads (Not a Modern Geared Head)**
- **Moy 16″ Classic**
- **Moy 16″ Standard**
- **Moy, Samcine Geared Head**
- **Moy, Samcine MkIII Geared Head**
- **Moy 16″ Neptune Underwater Head**
- **Moy 22″ Legend**
- **Moy 12″ Mini**
- **NCE Geared Head**
- **NCE Cradle Geared Head & Model CGH**
- **NCE Jr. Geared Head**
- **NCE/Ultrascope MkI**
- **NCE/Ultrascope MkII**
- **NCE/Ultrascope MkIII**
- **Panahead**
- **Panahead, Super**
- **Panahead, Compact**
- **Raby Geared Head**
- **QuickSet 4-72512-3 Geared Head (slide tilt)**
- **QuickSet 4-72612-S3 Geared Head**
- **QuickSet 4-52217-3 Geared Head w/ Large Platform**
- **QuickSet 4-52926-9 Geared Head w/ Calibrations**
- **QuickSet 4-62926-7 Geared Head w/ Calibrations**
- **Sea Head (currently unknown)**
- **Technovision Technohead MkI**
- **Technovision Technohead MkII (H)**
- **Technovision Technohead MkIII**
- **Worrall**
- **Worrall Mini**



Arrihead: Arri has two models on the market the Arrihead I, and the Arrihead II. However, the Arrihead I has been discontinued and can only be found in the rental market. The Arrihead II is the current production model and can be purchased from Arri Group Inc.

Arrihead I:

Tilt Angle: +- 30 degrees, +- 90 degrees with tilt plate.

Tilt plate increments: 13, 20, 25, 30, 40, 50, 60 degrees

Gear Positions: (Belt Driven / Five position gearbox)

1 (65 turns for 360* pan)
Neutral
2 (35.5 turns for 360* pan)
Neutral
3 (19 turns for 360* pan)

1 (17.5 turns for full 60* tilt)
Neutral
2 (9.25 turns for full 60* tilt)
Neutral
3 (4.75 turns for full 60* tilt)

Camera mounting: Quick release. 180mm forward and back Arri bridge plate (dovetail)

Pan/tilt drive: Tilt handle laterally adjusts up to 38 degrees to right 3-speed gear drive, plus neutrals.

Gearboxes with 5:1 reduction ratio available.

Locks & Levers: Tilt has *two* positive lock off brakes, while pan has one. Both have friction levers at the hand-wheels.

Dimensions (w/out wheels): height 12", length 20", width 11"

Weight: 39-43 lbs.

Maintanence: Arrihead I does not need to be lubricated. Clean for dirt and dust.



Arrihead II: *"Smaller, lighter in weight and equally efficient is the formula of the future… With an equal equipment range and operating convenience, it is 8 cm shorter and approximately 4 kg's lighter than the large ARRIHEAD."*- Arri Group Inc.

<u>Tilt Angle</u>: +- 30 degrees, +- 90 degrees with tilt plate.

<u>Tilt plate increments</u>: 20, 25, 30, 40, 50, 60 degrees

<u>Gear Positions</u>: (Belt Driven / Four position gearbox)
1 (65 turns for 360* pan)
Neutral
2 (35.5 turns for 360* pan)
3 (19 turns for 360* pan)

1 (17.5 turns for full 60* tilt)
Neutral
2 (9.25 turns for full 60* tilt)
3 (4.75 turns for full 60* tilt)

<u>Camera mounting</u>: Touch-n-go Quick Release
140mm forward and back Arri bridge plate (dovetail)

<u>Pan/tilt drive</u>: Tilt handle laterally adjusts up to 38 degrees to right. Gearboxes with 5:1 reduction ratio available.

Tilt has *two* positive lock off brakes, while pan has one. Both have friction levers at hand-wheels.

<u>Dimensions w/ Handwheels:</u> Length 22"/ Width 13" inch.

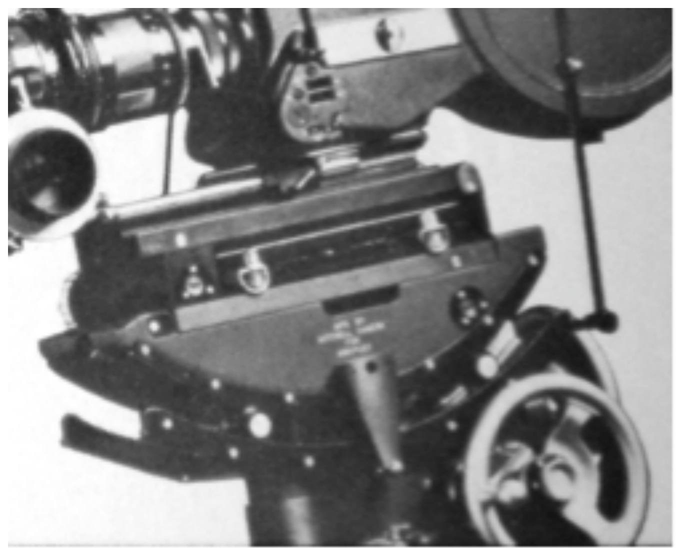
<u>Dimensions w/o Handwheels</u>: Length 18"/ Width 11" inch.

<u>Weight</u>: 33 lbs. / 39 lbs. (with wheels)

<u>Maximum Load:</u> 110 lbs.

<u>Temperature Range</u>: -4 to 122 F degrees/-20 to +50 C degrees

<u>Maintanence:</u> Arrihead II does not need to be lubricated. Clean for dirt and dust.



Arri/Mitchell Geared Head: No information is available at this time. The Arri/Mitchell head is mentioned within a Clairmont Camera advertisement around the 1970's. This photo is from another ad, but the words "MFG BY MITCHELL (illegible word) FOR ARRIFLEX" can be read, engraved on the cradle. Most likely an custom modified Mitchell or collaboration with Mitchell before making the ArriHead I head.

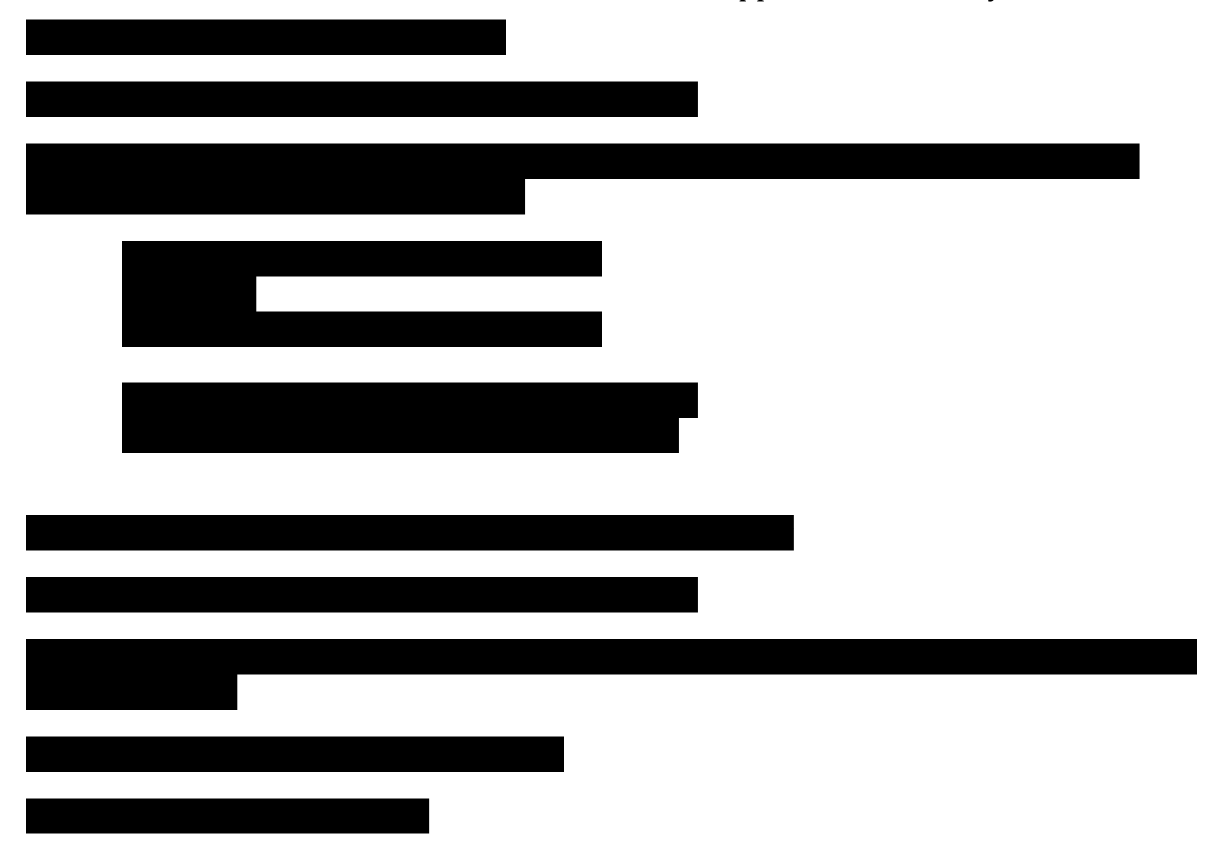
Houston Fearless Cradle Head: In 1950, the Houston Corporation of Los Angeles and Fearless Camera Company of Culver City merged to form the Houston Fearless Corporation. Among the camera equipment manufactured would eventually include the Houston Fearless Cradle. By 1964, Houston Fearless would be through with Hollywood, and begin contracted work for the US Government supplying high speed photo processing equipment to the Blackbird and U-2 Spy plane programs. A cradle head is like a geared head but lacks the geared wheel control. It's controlled instead, by a pan-handle.





GearNex GearHead: [redacted]





[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

^^STATS CHANGING, COMING SOON!^^

F&B/Ceco Blimp Type 2-Speed Geared Head (TH-7): At first glance it looks like a friction head, but look closely and you'll see it's a rather tall, strong, and heavy geared head!



Tilt Angle: 45 degrees Forward / 42 degrees Backward

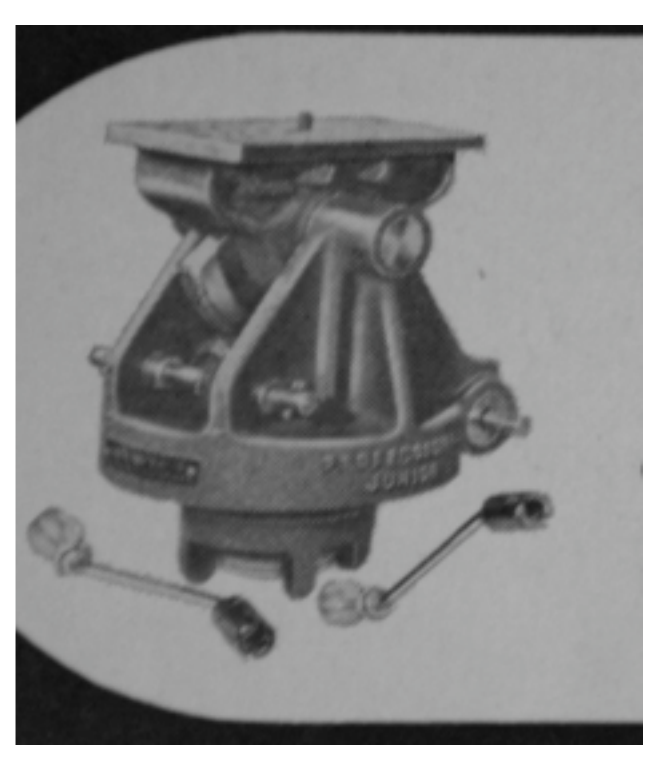
Gear Positions: (Gear Driven / Two Speed Gearbox)

A 1967 Ad states the two speeds are 'fast and slow'…

Height: 10.5"

Weight: 80.5 lbs.

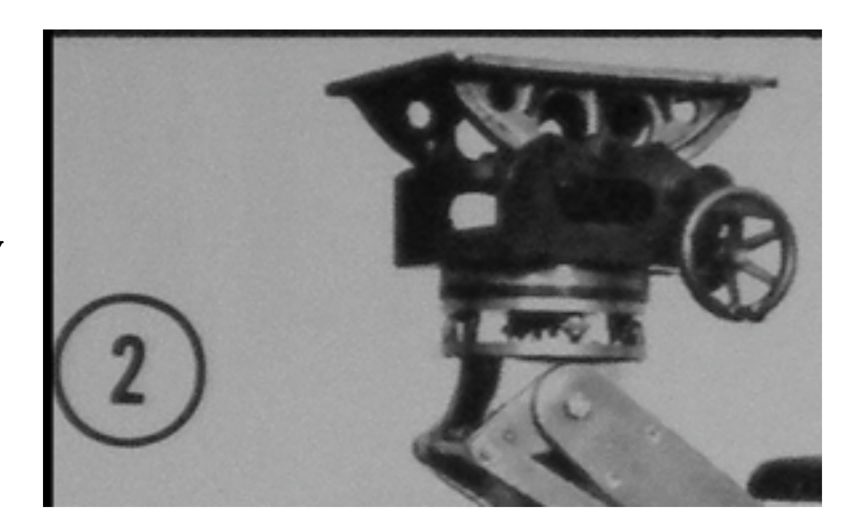
Maximum Load: 200 lbs.



F&B/Ceco Professional Junior Geared Head: Nothing is currently known about this geared head except it has either a ¼ or 3/8″ camera tie down screw and a 'standard Pro-Jr' flat base. It appeared in several brief advertisements in the late 1960's and early 1970's. From the build, price and name, one can assume the Pro-Jr is designed to be *much* more compact and light, compared to its big brother, the TH-7. The hand wheels have been replaced with cranks… something very reminiscent of 'pre-modern' gear based tripod heads.

MGM Geared Head:

The only information found on the 'MGM Geared head' was simply this photograph from a Birns & Sawyer advertisement October, 1972. Described as a 'MGM GEARED HEAD'.



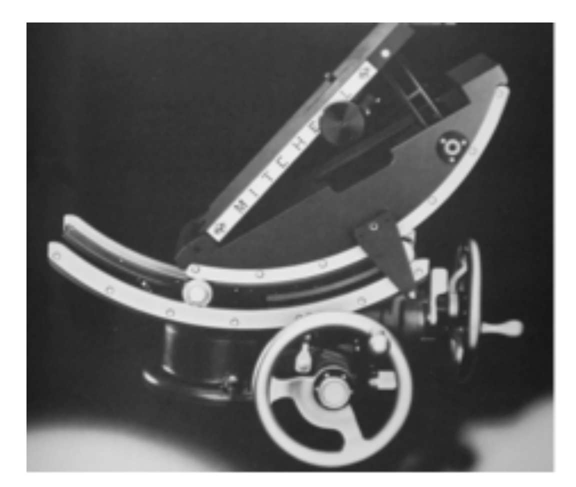


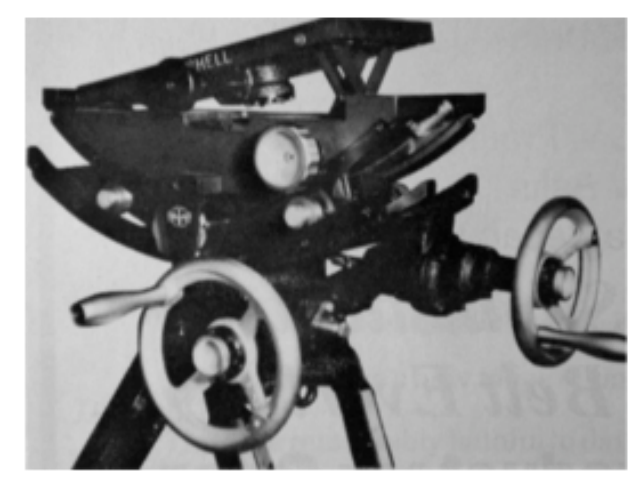
This Mitchell geared head was on display at the 1979 SMPTE conference. The photograph's original caption simply stated it was a 'new' Mitchell geared head with built-in adjustable wedge plate. Most likely a Mitchell Lightweight.

Mitchell Geared Heads: The Mitchell Camera Corporation, located in Los Angeles, CA, was one of the earlier companies to manufacture geared tripod heads. Ironically, in the early 1940's, George Worrall was Chief Engineer at the Mitchell Camera Corporation. He left the company because he 'felt he could accomplish more on his own.' Less then a decade later, after founding the Worrall Camera Corporation, the Worrall geared head would revolutionize the industry, and dawn a new era of the geared tripod head; one in which the Mitchell Camera Corporation would continue to contribute.

To the best of this author's knowledge, the Mitchell brand would produce four 'modern' geared head models: the Mitchell, Mitchell Mini (Lightweight), Mitchell 'VistaVision', and the Mitchell Vitesse geared head. Mitchell geared heads were discontinued long ago, but they are still found in many rental houses, visual effect houses, and film facilities all over the world.

Mitchell Geared Head: Surprisingly enough, it is very difficult to track down what is considered the 'original' or 'standard' Mitchell Geared Head. Thus far, from extensive research, it is thought that the 'normal' Mitchell geared head model is a four position, three speed gearbox.





Mitchell Mini/Lightweight Geared Head:

Tilt Angle: +-33 degrees, +- 50.5 degrees w/ Tilt plate, as told to me by a Mitchell Mini owner.

Built in Lift Plate: Advertised at +- 60 degrees in an old ad. This does not add up with the 17.5 degree tilt plate information given by the gearhead owner, perhaps the advertisement was a previous version of the model.

Gear Positions: (Gear Driven / Four position gearbox)

1 (63 turns for 360* pan)
2 (31.5 turns for 360* pan)
3 (21 turns for 360* pan)
N

1 (16.75 turns for 66* tilt)
2 (10.5 turns for 66* tilt)
3 (5.2 turns for 66* tilt)
N

Three Speeds Gear Ratios: 1:1 / 1½:1 / 3:1

Length: 17.25" / 20.75" inches (with wheels & handles)

Width: 10.5" / 14.75" inches (with wheels & handles)

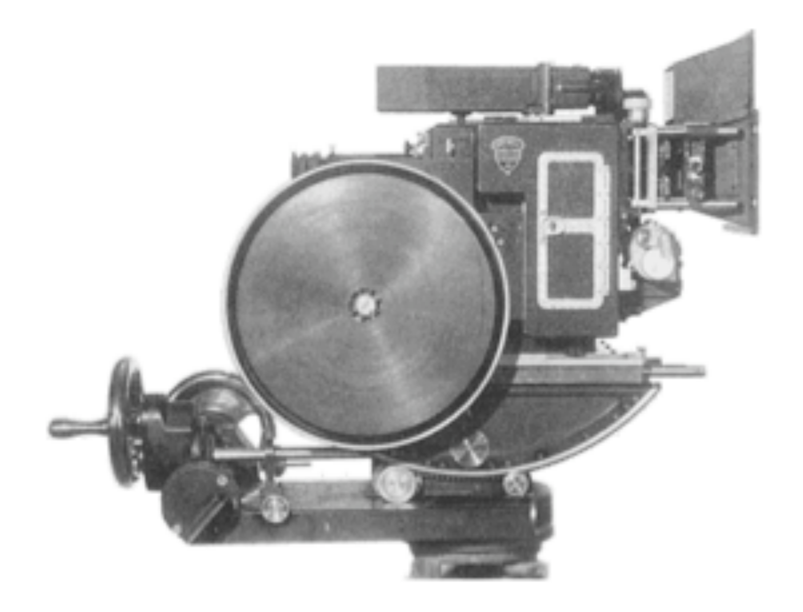
Height: 9" inches

Weight: 44 lbs.



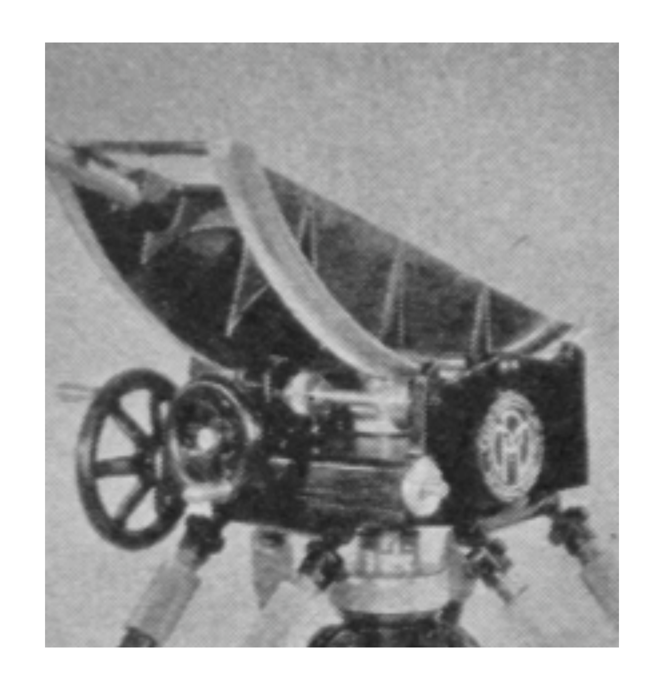
Mitchell Vitesse GearHead:

With regards to design, the Vitesse is quite possibly the most unique geared head of any. It is designed in a way, to allow 360* movement on two axis; pan *and* tilt. The inventor of the Vitesse is Joe Dunton who interestingly, later in his career, would head 'Moy'; another manufacturer of geared heads.

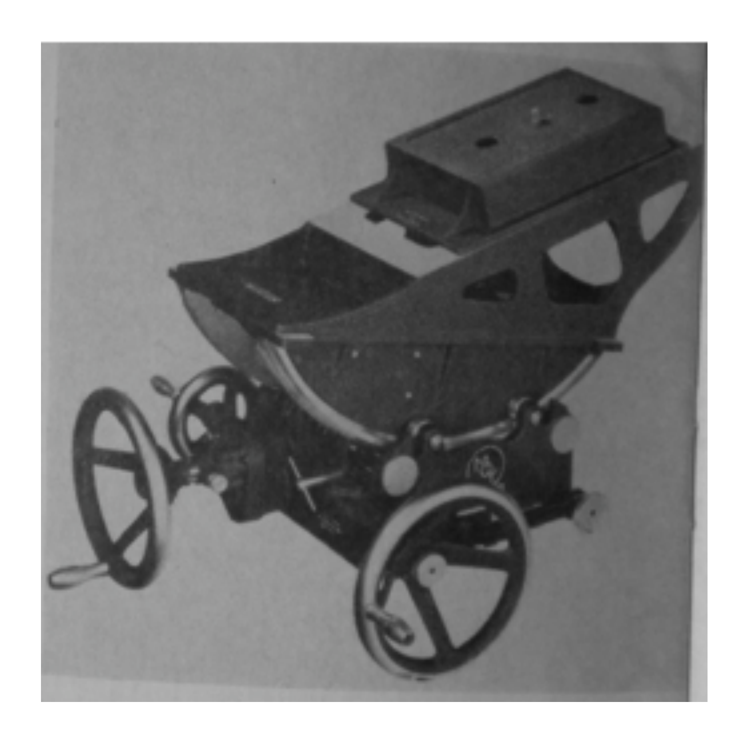


Mitchell 'VistaVision' Geared Head: The large Mitchell 'Vista-Vision' geared head, is aptly named for its association and pairing with the Vista-Vision cameras. To operate around the bulging 'elephant ear' cameras, the hand wheels were extended along a shaft, away from the cradle.

Mole Richardson Geared Heads:
A 'modern' era Mole Richardson Geared head has not been found as of yet. This model was described in the 1930 Cinematographic Annual as, "… another new device. It is a tilt head mechanism on a Rohing Tripod." This is a great example of the geared heads which existed and were in use prior to the Worrall head, which because of it's successful advancements, is considered the dawn of the modern geared head era, which today's heads continue to advance.



Moy Geared Heads: Known as one of the more popular geared head brands, Moy was based in London, England and eventually, during its later years, fell under Joe Dunton & Company Limited. Panavision later acquired Joe Dunton's company holdings in 1997, and presumably Moy with it, considering they inherited a very large quantity of Moy geared heads. (The pictured Moy 'Classic or Standard' has an auxiliary third wheel for pan movement.)



Today, Moy geared heads are primarily (& appropriately) found in rental facilities around the UK, including many Panavision Europe facilities. As of 2008, Panavision UK rented all four of the Moy Geared Head models which include the **Moy 16″ Classic, Moy 16″ Standard, Moy 12″ Mini,** and **Moy 22″ Legend.** Other European Panavision rental houses also carry what is called the **Moy 'Neptune' Underwater Head.**

One will quickly notice a strange and unique attribute of some Moy Models: a third wheel. In the photograph above, the third wheel is almost certainly an auxiliary pan wheel. In the photograph on the following page, the odd placement of the third wheel (within the cradle) may be an auxiliary pan wheel, or perhaps something else, such as for a crank up tilt wheel or auxiliary tilt wheel. Unknown at this time.



Moy 16″ Standard/Classic:

The most common Moy, the Moy 16″ Standard, is a two speed geared head. The Moy 16″ Classic is found as a listed geared head in many rental houses, but perhaps is the same as the 'standard'. No information known at this time suggests either possibility.

Samcine Moy Geared Head: A Moy Standard, re-engineered to rental house Samuelson's specifications by Moy. Improves upon the previous Moy geared head, although the cradle movement and gears remain virtually the same. A new built in wedge allows for extra tilt function, camera quick release ability, and balance adjustment for long lenses or off center configurations.

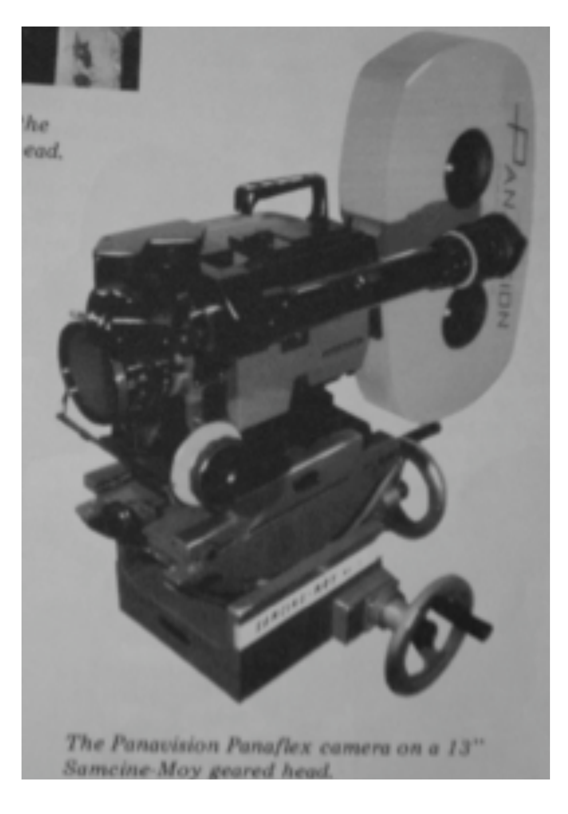

THE SAMUELSON-MOY GEARED HEAD CAMERA MOUNT

Tilt Angle: +-35 degrees, +-70 degrees w/ built in wedge

Gear Positions: Two speed gearbox
1 (34 turns for full 360*)
2 (12 turns for full 360*)

1 (23 turns for full tilt)
2 (9 turns for full tilt)

Offset arms available and incorporates 2:1 pan and tilt speed increase.


The Panavision Panaflex camera on a 13" Samcine-Moy geared head.

Samcine- Moy geared head MkIII:

The MkIII head has a built in slide balancing adjustment, an either-way-round adjustable wedge, a dovetail camera attachment, optional off-set control positions, two speed pan and tilt action (four speeds with the offset arms) a large 'T' level, and adjustable pan friction. It is also advertised as a 13" head.

Moy 22″ Legend:

As the photo demonstrates, the 22″ Moy geared heads are meant for some serious weight and abuse. Pictured here, Jack Cardiff, BSC and Geoffrey Unsworth, BSC pose with a Technicolor 3-strip camera on a 22″ Moy geared head. In today's world it is very rare for any camera package to require a special 'heavy duty' grade geared head. Only fully loaded 70mm or Imax packages demand such extra support.



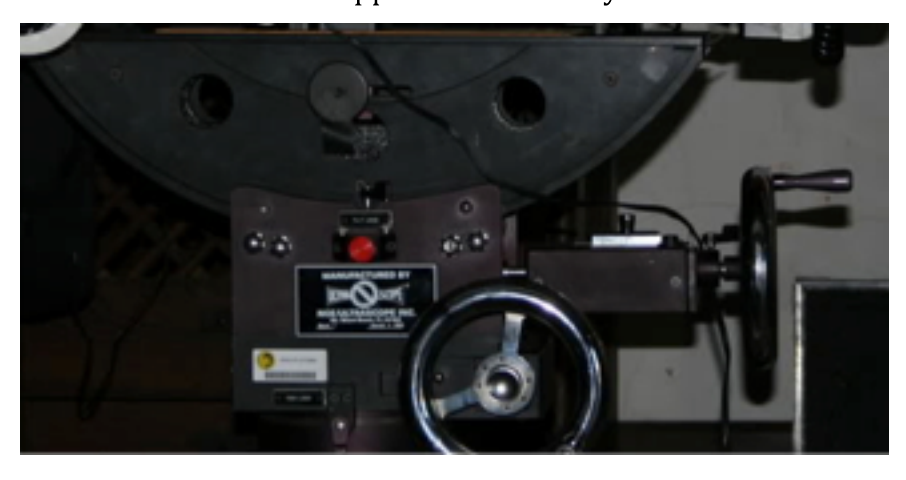
Mini Moy Geared Camera Head

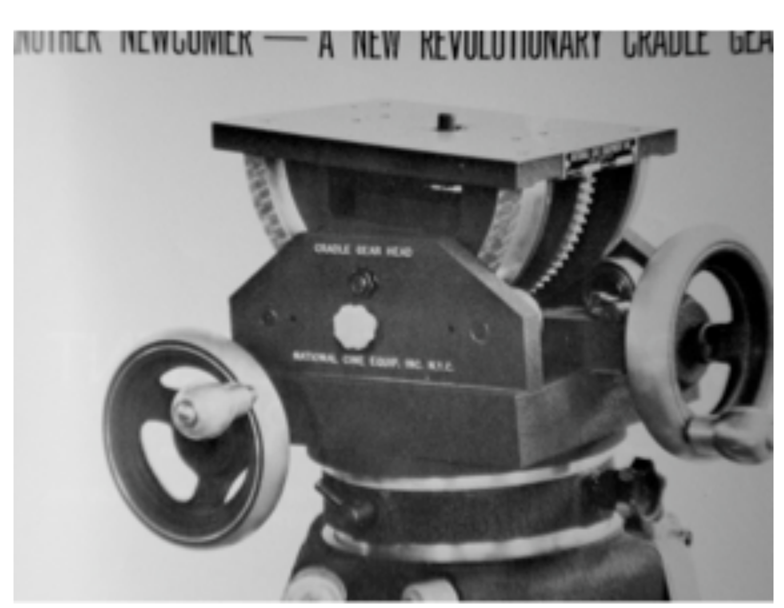
Moy 12″ Mini:

The baby of the Moy family, the 12″ Mini was designed and built in another attempt to reduce the size and weight of the geared head while attracting the smaller camera market, such as 16mm production. The 12″ Mini is tough to find information on. It is advertised as a gear head, not cable driven (referring to the competitive Worrall Mini). The lowest gear ratio is 94 turns for 360*. The mini weights 38 lbs and extension boxes are available.

Moy 16″ Neptune Underwater Head: European rental houses list it as MY-UH head. Any cameraman, who dares enter the ocean's water with a geared head, might as well strap the camera to an anchor! Nonetheless, this is one of the most unique, mysterious, and interesting geared heads to date. Further information is top priority. Please harass Panavison UK, and/or Panavison's associate rental house Sparks in Hungary… they won't respond to email inquiries.

NCE Geared Heads: National Cine Products made the NCE, Cradle Geared Head (updated to 'Model CGH'), NCE Jr, and finally the Ultrascope series MkI-MkIII. NCE no longer exists and NCE heads are rare in most capacities.

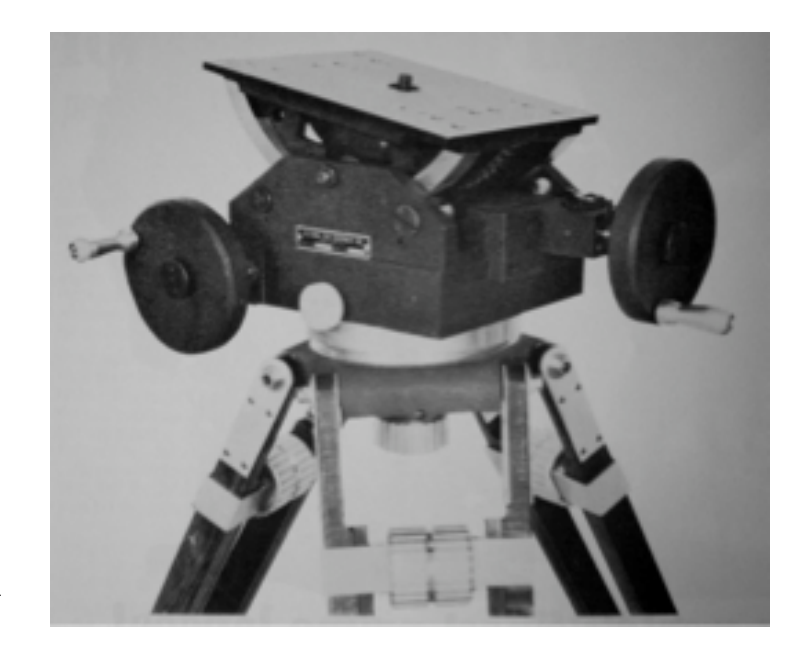




NCE 'Cradle Geared Head' and 'Model CGH':

Tilts +-35 degrees, wedge available. Pan has tension adjustment and lock. Tilt has only tension adjustment. Top plate is 5½" x 7". Weighs 22 lbs and will carry cameras up to 30 lbs. Equipped with a ball level and Mitchell adapter available. NCE Advertisement, Nov. 1969.

The NCE 'Model CGH' is the updated and improved NCE Cradle Geared Head. The 'Model CGH' will carry 30lbs, same as the previous, except this ad from 1970, mentions a *three*-position pan gearbox: two speeds and a neutral. The tilt is a two-position two-speed gearbox. The top plate is larger at 6.5" x 8". Also advertised: 'Change in speed can be made by cameraman in seconds'… which suggests the previous model only had one non-adjustable gear speed. Pan and tilt locks and tension adjustment standard.





The NCE 'Model CGH':
NCE advertisement; two years later, in 1972. A 'new and updated' NCE Model CGH. This advertisement does not mention *what* is necessarily new about this make, but does mention fingertip controlled 2-speed pan and tilt. From the wording and mention in the ad, perhaps an improvement upon how easily the operator changes between gears. The riser plate seen in photo was available for the 1970 CGH.

NCE Jr.(Compact): The NCE Jr. Compact, might possibly be an NCE model CGH, but with a new name or features. The Model CGH is designed for small payloads and weight, so I am awaiting photographs and stats from DP Rachel Dunn to confirm. She describes the odd design of the pan wheel located at the *front* right side of the geared head, something one can clearly see in the above Model CGH. The following are her findings from the experience with her geared NCE Jr. head:

<u>Tilt Angle</u>: +-30 (estimate)

<u>Gear Positions</u>: (Gear Driven / Three position gearbox for Pan / Two position gearbox for tilt)

1 (__turns for 360* pan)
Neutral
2 (__turns for 360* pan)

1 (__turns for full 60* tilt)
2 (__turns for full 60* tilt)

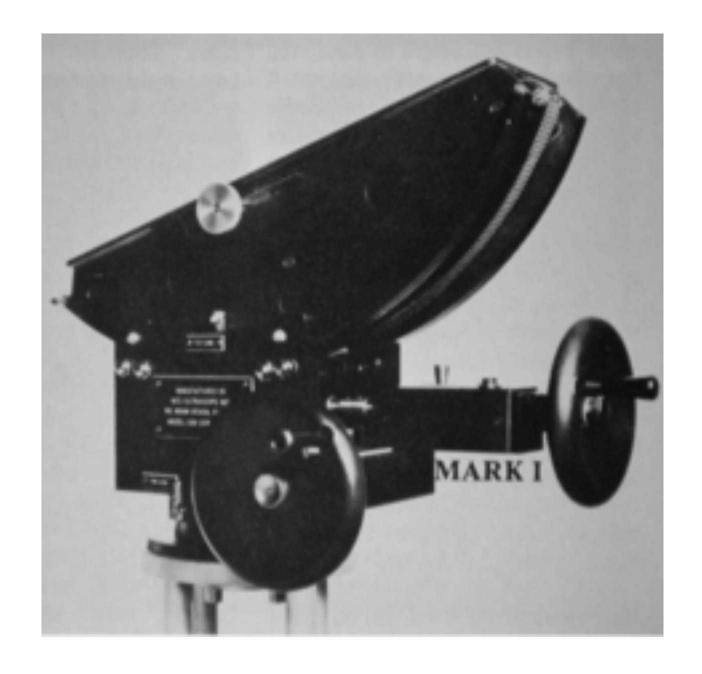
<u>To change gears</u>; "lift a thin piece of metal out of it's channel on the wheel axle and pull the whole wheel out (or push it in) about an inch or so, to engage the other gear."

Tilt and pan have *one* set of friction levers and brakes.

The Pan wheel is oddly located at the front left, versus the standard location of the rear left.

<u>Weight</u>: 33 lbs.
<u>Dimensions:</u> 8"x8"x8"
<u>Maximum Payload:</u> Under 25-20 lbs
<u>Maintenance:</u> Takes lubricant grease for the gears.

NCE/ Ultrascope MkI Geared Head: +-40 degrees of tilt range and an unlimited pan range. Flat top with a 3/8- 16 inch tie down/ and full 3" balance movement. 6,9,12 degree pan gears.



NCE/Ultrascope MkII Geared Head: The same as MkI but has Arri Slide rails and an exclusive 1½" bridge plate. Advertised to have '6,9,12' degree pan gears. Not sure what that really indicates. Does not have a geared wedge.



NCE/Ultrascope MkIII Geared Head: Same as the MkII but has the added geared wedge, for greater tilt ability. An additional 55 degrees of tilt is gained, for a total of +-95 degrees. A longer balance plate gives greater distribution of weight. Has the '6,9,12' degree pan gears.

The Panahead: Panavison won the 1977 Scientific or Technical Award (Academy Citation) for the engineering of the Panahead geared head for motion picture cameras. A little known fact: Geared heads should generally not be under-slung, but certain Panaheads can be. Red engraved nameplates can identify them as units able to be under-slung.



Tilt Angle: +- 30 degrees, +- 90 degrees with tilt plate.

Gear Positions: (Belt Driven / Four position gearbox)
1 (75 turns for 360* pan)
2 (41 turns for 360* pan)
Neutral
3 (21 turns for 360* pan)

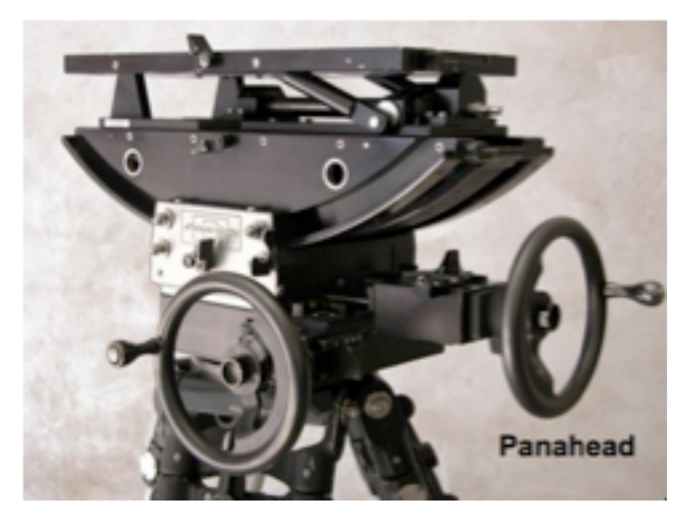
1 (15 turns for full 60* tilt)
2 (8 turns for full 60* tilt)
Neutral
3 (4 turns for full 60* tilt)

Camera mounting: Dovetailed top of a tilt or double tilt plate. Will accept a sliding plate from a Panaflex undercarriage.

Tilt and pan have *one* set of each tension levers and brakes.

Weight: 38.5 lbs.

Maintenance: Loosen screws on side of Panahead and remove cover: Try to brush dust away instead of blowing it with compressed air. Lubricate rails and dovetails with silicone only. Use low temperature grease on pan and tilt selector knob guides.



Super Panahead: The Super Panahead, is a wider, stronger, and more robust Panahead. It accommodates larger payloads, which make it ideal for large 35mm/zoom packages or 70mm photography. Super Panaheads tend to have the more robust geared crank tilt plate design.

Compact Panahead: The Compact Panahead is indeed a very rare model. There are currently only two available in Los Angeles and perhaps the world. They are thought to have been introduced around the same time as Panavision's 16mm 'Elaine' camera, and have not been produced since.

The Compact Panaheads are simply smaller, more lightweight versions of the Panahead; only able to take lighter weight loads… appropriate to be unveiled with the Elaines. Sadly, they are not used often. Last I checked, there was only one at PV Hollywood and one at PV Woodland Hills. The PV Woodland Hills model has never gone out (on record) since the computer database was installed. Rightly so, when I went to use it, it was missing the sliding plate dovetail! Normally a substitute dovetail would be an easy fix, but since the PH-compact is so small, it was designed to have a smaller tilt plate, with a smaller dovetail track, requiring a proprietary custom machined size sliding plate dovetail; smaller then any other Panavision standard. Without the rare and specific sliding plate dovetail, the camera cannot dock to the tilt plate. I have personally inquired with several employees at Panavision to machine a replacement, but I was told there wasn't enough demand for the small guy. I think I'll try to get a photograph of it before they eventually melt it down or use it as a pricey paperweight.

Raby Geared Head: Found in a 1956 Advertisment, from the American Cinematographer Hand Book and Reference Guide, Raby MFG. Company produced its own line of blimps, geared heads, and dollies. The picture is unfortunately to small to make even the simplest deductions. Nothing else is known about this geared head brand.





Quickset Geared Heads:
QuickSet International is a maker of precision positioning systems. For commercial or government/military use, they offer many heavy-duty tripods and heads, which are made for accurate positioning, remote controls, and heavy payload security cameras or likewise equipment. In the opinion of this author, the products look like garbage and are not for professional motion picture use. Perhaps a cheap prosumer level?

The Quickset 4-72512-3 is part of the light/medium weight 'Samson' class. The unit can tilt 45 degrees up and 90 degrees down. The pan can rotate 360 degrees at a 1:150 single gear ratio. The camera mounts via a 1/4 inch screw. The head is 2.5 lbs and can hold a payload of 25 lbs. Its dimensions are 8.5" x 6.5" x 6". The only geared function is the pan. The tilt is a 'slide' tilt.



4-72512-3



4-72612-S3

The Quickset 4-72612-S3 is another light/medium weight 'Samson' class head. The unit can tilt 35 degrees up, and 90 degrees down. It can rotate a full 360 degrees at a single gear ratio of 1:150. The camera mounts via a 1/4 inch screw. The head is 2 lbs and can hold a payload of 35 lbs. Its dimensions are 11.75" x 8.25" x5.5". Only the pan is geared, while the tilt is pan-handle controlled.

The Quickset 4-52217-3 is part of the heavy weight 'Hercules' class head. The unit can tilt +-45. It can pan a full 360 degrees with a single pan gear ratio of 1:96. The tilt function is geared with a single gear ratio of 1:129. The camera mounts to a 3/8th inch screw. The head is 12 lbs and can hold a payload of 50 lbs. Its dimensions are 8" x 10.5" x 11.5". Both tilt and pan are single geared. The top plate is larger at 9" x 6".



4-52217-3



4-52926-9

The Quickset 4-52926-9 is another heavy weight 'Hercules' class head. The unit can tilt 45 degrees up and 90 degrees down at a single gear ratio of 1:129. It can pan a full 360 degrees at a single gear ratio of 1:96. The camera mounts to a 1/4 inch screw. The head is 9 lbs and can hold a 30 lbs payload. Its dimensions are 8" x 9.5" x 10.75". Both pan and tilt are geared, although gears are cut off in photo. This head has carefully marked calibrated markings along the tilt cradle and pan cylinder.

The Quickset 4-62926-7 is a Extra Heavy weight 'Gibraltar' class head. It can tilt 53 degrees up and 67 degrees down at a single gear ratio of 1:128. It can pan 360 degrees at a single gear ratio of 1:96. The camera mounts by a 3/8 inch screw. The head is 21 lbs and can hold a payload of 200lbs. Its dimensions are 10"x10"x12". The top plate is the largest at 8" x 10". It also has the calibrated etchings along both axis of movement.



4-62926-7

The SEA Geared head: Likely this is the most difficult geared head to track down and find information. I have thus far only found the name listed on European rental catalogues. I have never heard of one being used, seen a photograph, or even a technical spec. It may likely be an underwater head. Another theory is pendulum 'sea' head. A pendulum hangs underneath the tripod head, which is on a ball type mount. Thus the head constantly levels itself to the horizon… good for when on a rocking boat or on the 'sea'.



Technovision Technoheads: Technovision Camera LTD, was a camera rental company with facilities across Europe. In 1986, Technovision built their first 'Technocrane' marking the beginning of their departure from the camera rental business. Since that time, Panavision has bought some of Technovision's inventory, such as Technovision France. Technovision London and Italia still exist today, specializing exclusively in crane and remote system rentals.

Technovision MkI: Unknown Information. The Technovision line is very hard to locate or find information on. Thus far no information on the original Technovision MkI can be found. It's existence is only proven because a MkII and MkIII do.

Technovision MKII: A rare model even in the rental market, little can be found about the Technovision MkII. It is a brass geared head, three speed gearbox. Optional gear reducers available, providing more control with gear ratios. The Technovision head in this photograph is advertised as a Technovision MkII.



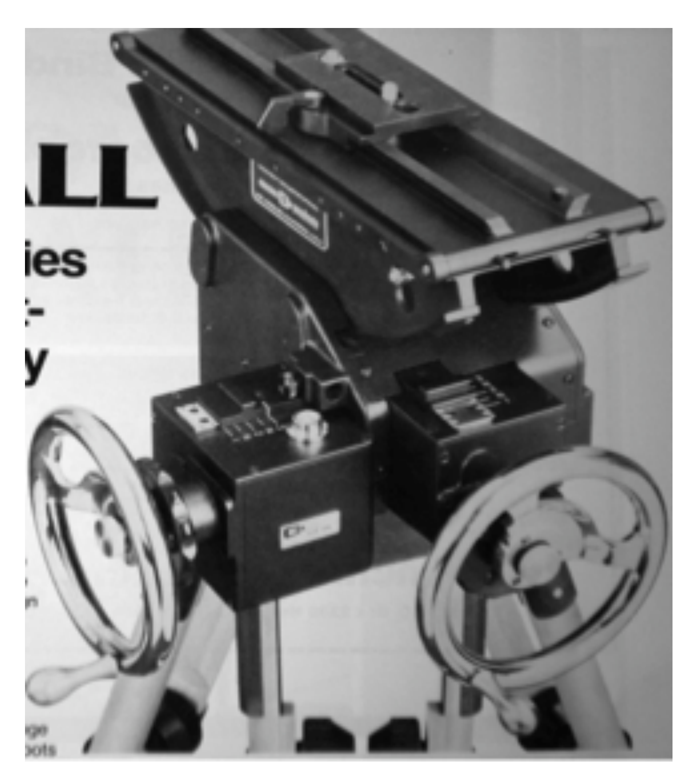


Technovision MKIII: The most advanced and modern geared head within the Technovision line. The MkIII comes with a double wedge tilt plate, for +-90 both ways. Weighs around 44 lbs.

Worrall Geared Heads: Finally, and appropriately the Worrall Geared Head. Invented by George Worrall of the Worrall Camera Company, this head is considered to be the birth of the modern geared head. The Worrall Geared Head was the industry workhorse. George Worrall would make more than 600 units before eventually retiring. The manufacturing rights would be sold to Cinema Products Corporation. This advertisement from February 1976, announces Cinema Products Corp, ability to now manufacture Worrall Gear Heads.



"It's putting mechanical parts that are available to new use. I did what I though the cameraman needed for ease of operation… I made a couple for Warner Brothers. And then I never had to advertise from then on." – George Worrall



Worrall Mini: Once Cinema Products owned the rights to the Worrall brand, they designed and developed the Mini Worrall, a cable/gear head. The Mini is the only cable/gear drive head in the world with aerospace-style high-tensile strength cables. The cables support pan and tilt loads… 'maintaining constant tension throughout the entire range of cable travel without play.'

<u>Tilt Angle:</u> +-30 degrees, +- 92 degrees with tilt plate.

<u>Gear Positions:</u> Five position / three speed gearbox (1-N-2-N-3)

Cable drive only permits 370 degrees of rotation… 185 degrees in either direction of a 'neutral' point.

<u>Camera Mounting:</u> Dovetailed tilt plate can take CP, Arri & moviecam quick release plates.

Pan wheel lock and brake, Tilt wheel brake.

Mini Worralls with serial numbers under 155, cannot remove their wheels. Those with serials 155 and over, can.

Made from anodized aluminum.

<u>Weight:</u> 39½ lbs.

Geared Head Facts & Reminders:

- Geared Heads should always be transported with gears either in neutral or disengaged. All pan and tilt locks should be left loose, including hand wheel brakes or tension levers. Remember to disengage travel wedge, gears, and etc… If geared head allows.

- Always keep geared heads clean and know proper maintenance. Some geared heads take oil, some a special high-pressure grease, and some require neither. Know maintenance; it varies.

- Almost all geared heads have pan-handle rosettes, for which a pan handle may be attached to the cradle. The pan-handle is to be used for quick whip-pans or other moves which are unattainable by using the wheels. To use the pan-handle, place the pan and tilt gears to neutral and for heads able, it is best to disengage the gears such as the internal worm gear from the central pan gear within a Panahead.

- Some geared heads have multiple 'bushings' (holes through the cradle) for the purpose inserting carry rods, should the geared head need to be moved with the camera mounted.

- All geared heads are either made to be used on a Mitchell mount or have adapters to do so. Geared Heads sit on Mitchell mounts 95% of the time.

- Although gear ratios are different on all heads. The wheels will turn the head in the same direction with the same action, just not in the same ratio of pan and tilt rotations.

- Belt driven geared heads need to be tightened periodically.

This concludes my second exploration into geared heads. If there is any misinformation or new information you would like to mention, please feel free to contact me via email at RyanPatrickOHara@gmail.com.

Thanks,

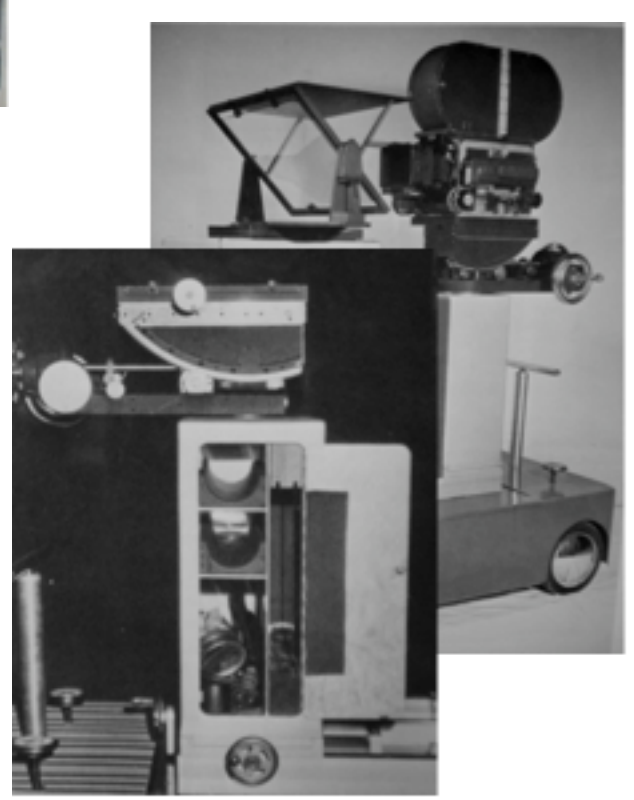
-rpo

The following are select images I found interesting. There are literally thousands of photos with famous camera operators and cinematographers using geared heads. These photos have some unique qualities and points.



The Empire Strikes Back; Motion control rigged geared head from ILM.

'FPC 101' Front projection unit, circa 1970. The Geared Head pictured is a 35mm 'VistaVision' Mitchell Geared head. The body and gears have been custom modified and redesigned for nodal point panning and tilting.





This geared head is electronically driven via motion control. Miniature cityscape from *Blade Runner*, 1981.

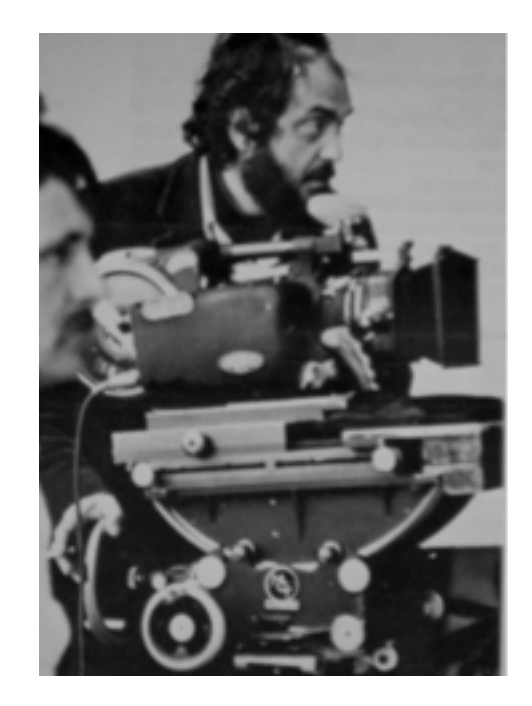
Sweden 1926: Ray Fernstrom, ASC standing with Swedish Crown Price and future King Gustaf VI Adolf. Notice the geared cradle with tiny crank arms. This is a great example of early-geared tripod heads, which would eventually evolve to the modern day geared head.





Harry Waxman, BSC sits at the wheels of a geared head identifiable as a Moy by the classic 'Moy London' badge.

Stanley Kubrick behind the wheels of a Moy Geared Head… all three of them! The 'third' wheel is an auxiliary pan wheel. The only reason I have found was written in an old American Cinematographer magazine. Apparently operators would occasionally have an electronic zoom lens control or likewise control mounted to the other side of the camera. When you think about it, that still doesn't make to much sense. Operators don't have three arms!





Robert Surtees, ASC helms what is assumed to be a Samcine-Moy geared head with the even more unusual third wheel attached to the cradle! What does this actually work? Auxiliary pan? Tilt? Geared tilt plate?

Another photograph of a Mole Richardson geared head, which was manufactured over 20 years prior to the Worrall geared head. This photograph was from the Universal film, *The Strange Affair of Uncle Harry*, 1945.



A Few Unusual Circumstances



This photograph highlights the importance and possibilities of a tilt plate. This geared head is most likely only able to tilt +-30 degrees, but with a sturdy tilt plate, can get to a full +-90 degree angle.



Unidentified geared head taking a 70mm camera on its side for vertical recording and future vertical display.

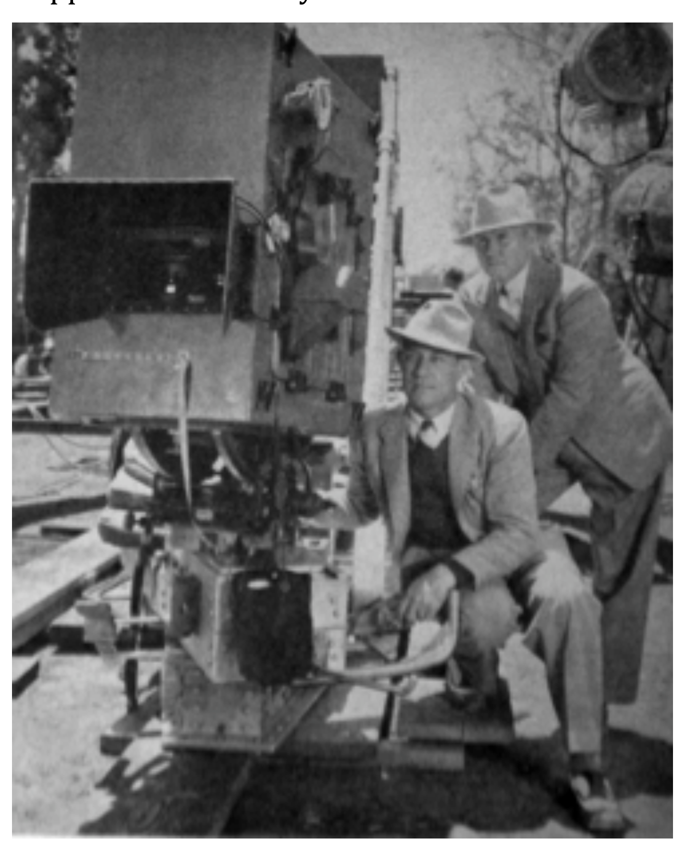
Geared head mounted to planks of wood, riding up in a bucket for some high-up shots of trapeze performers (aka cherry picker, condor, etc.)





Large Worrall geared head taking maximum punishment, in an Eastman Kodak advertisement 1966.

Just when one thinks it couldn't get any worse! Ernest Haller, ASC and Ray Rennahan, ASC with a Technicolor 3-strip camera and blimp. Large geared heads of yesteryear were accustomed to such mammoths.





Timothy Galfas floats through the Okefenokee swamp with his Imax camera atop a classic Worrall geared head.

This setup, atop a Worrall head, is a unique system called LightFlex and FlexLight. It emits colored light toward a subject for fill, and/or it can emit the light toward the lens causing shadow areas to be tinted, while leaving skin tones and highlights unaffected.





A Worrall head is creatively placed upon a 'monorail dolly'. This dolly is simply an 'I beam' like track for a smooth dolly action over rough terrain.



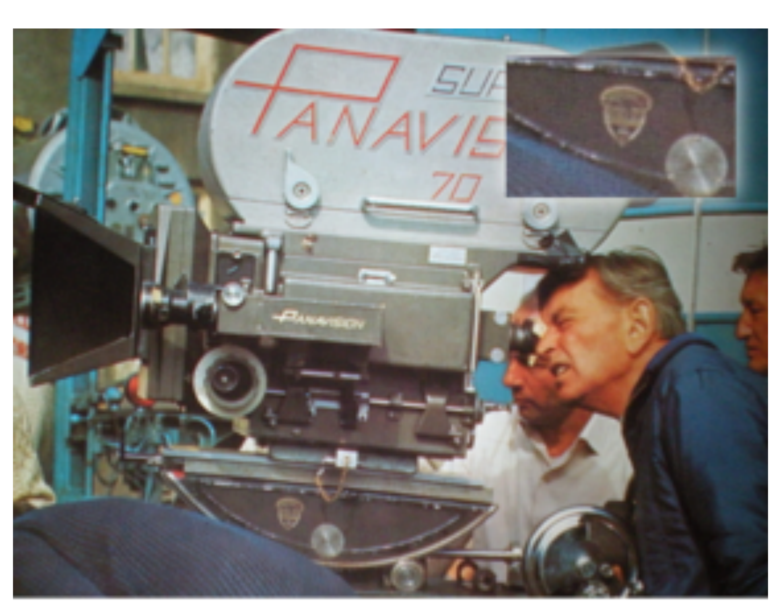
Camera operator sitting in the back of a camera car with unidentified make of geared head. Nuremberg Germany, 1967.



Unidentified Mitchell 'geared' tripod head. Notice the crank… quite possibly before the 'modern' geared head era. Photo stolen from Ron Dexter. Sorry!



Very good condition matte black Mitchell Mini owned by Jeff Crumbley.



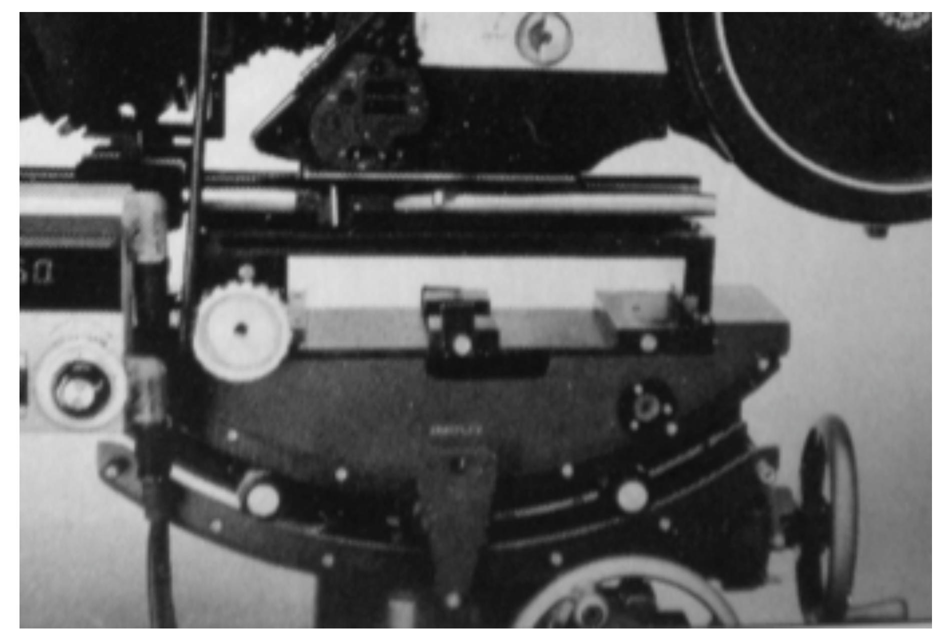
Shooting *Ryan's Daughter* in Ireland: Director David Lean looks through the viewfinder of a Panavision 70 film camera atop a Mitchell 'VistaVision' geared head. Notice the extended hand wheel shaft, that otherwise would be avoiding the elephant ear magazine drums on Vistavision cameras.



An example of an 'Elephant Ear' Vistavision camera. Notice how the hand wheel shaft gets the wheels a comfortable distance away from the film drum.

The Super Panahead is hard to identify at a glance or in a photograph. Looking for a geared tilt plate and the small word 'Super' written above the Panahead badge, are two of the few tell signs afforded to the observant.

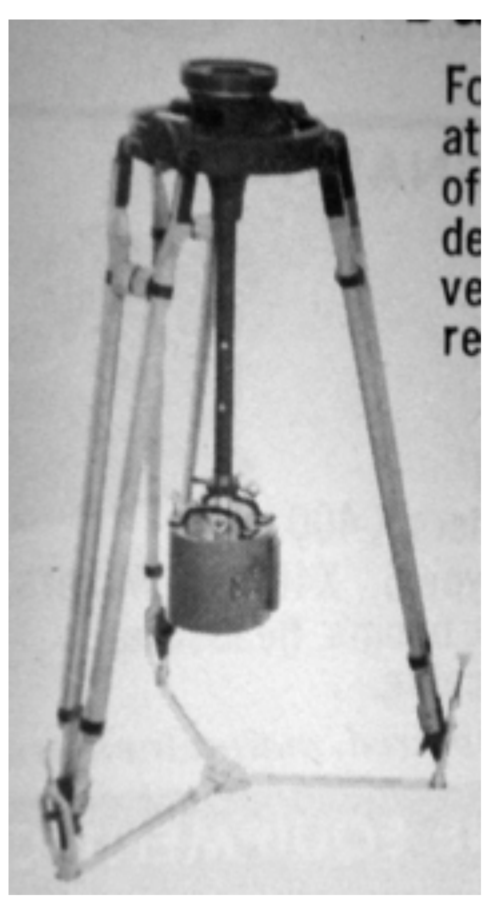




Extremely hard to read from this reduced size photograph… this geared head simply says 'Arriflex'. It looks like a Mitchell, so it is either an Arri/Mitchell geared head, or simply a Mitchell owned by Arri, and engraved for labeling sake.

Houston Fearless, is not a full functioning geared head, although it may look it. It is technically a cradle head. It pans and tilts on the same type of bearings and cradle design, but it lacks the wheels and internal gears to make it move. Instead a pan-handle attaches to the cradle and is used to manipulate the heads movement.





This is a 'pendulum' head of which was described under the 'Sea Head' description. It is possible the Sea Head, is a Geared Head which has been manufactured or affixed to this type of base, allowing the horizon to keep level aboard an oceanic vessel or otherwise wobbly surface.